DOCUMENT RESUME

ED 286 830 SP 029 297

AUTHOR Blai, Boris, Jr.
TITLE Thinking Skills & Intelligence.
PUB DATE [86]
NOTE 12p.
PUB TYPE Information Analyses (070)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Cognitive Processes; Educational Research; Epistemology; Metacognition; Problem Solving; *Skill Development

ABSTRACT

A review of research and the views of researchers prominent in the field of thinking skill development discusses the role of thinking skills in the ability to formulate problems, resolve issues, determine the most effective decisions, and create effective solutions to problems. The views of Edward deBono, Robert Ennis, Reuven Feuerstein, Matthew Lipman, David Perkins, Robert Sterling, and Arthur Wimberg are synopsized, as is research regarding essential, higher-order, metacognitive, and epistemic cognitive processes. (CB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED286830

Thinking Skills & Intelligence

Overview:

The honing of thinking skills (those skills which comprise the varied dimensions of cognitive development) is not automatically achieved in subject-matter instruction. The ability to formulate problems; to resolve issues; to determine the most effective decisions; to create effective solutions to problems - are particular and specific thinking skills which must be developed. As Lochhead (1985) has indicated, current research increasingly suggests that the effective development of higher-order thinking skills does require more than simple coverage of subject content.

Additionally - as Presseisen (1986) cogently comments:

> "The development of thinking skills instruction is also rooted in a history of testing in American schools. Much of the impetus behind the current reform movement in education stems from concern over declining standardized test scores. .... Particularly in the performance of higher order reasoning skills, it is claimed (see Carnegie Task Force - 1986) that American youngsters - and their teachers - may not be competitive with the students and teachers of other industrialized societies. Teaching thinking, explicitly and intentionally (underlining added) is offered as a major strategy to remedy this situation." (p.6)

Kinds of Thinking

There is now widespread agreement that there are indeed various kinds of thinking. There also appears to be little question that "some basic cognitive processes are important for all youngsters to master and that more complex operations need to be developed and practiced." (Presseisen, 1986:p.7) In the current educational focus upon the teaching of thinking skills, seven researchers appear to be prominent:

1- Edward deBono (1983) offers, as a succinct definition of thinking, that it is "the operating skill with which intelligence acts upon experience." (p.703) Additionally - he maintains that thinking evidences creative dimensions as well as a perceptual base, and "just being critical is not enough for good thinking, in school or life in general." (Presseisen, 1986:p.8)

SP029297

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

B. Bhai

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

BEST COPY AVAILABLE

2- Robert Ennis (1985) who postulates critical thinking as the principal dimension to be learned in order to think effectively.

> "He considers critical thinking to be the reasonable reflective thinking one performs when deciding what to believe or do. It involves both dispositions and abilities such as inference, induction and deduction. ... Ennis also stresses the importance of clarity of information to inform thinker's decisions." (Presseisen, 1986:p.8)

3- Reuven Feuerstein (1980) in "his research on structural cognitive modifiability suggests thinking patterns can be changed with appropriate intervention at any time in life and for any population. ....The teacher's role as a mediating influence is the key to success in his instructional approach." (Presseisen, 1986:p.8)

4- Matthew Lipman (1985) "stresses the importance of philosophy and reasoning with language as the basis of developing children's thinking ability." (Presseisen, 1986:p.8)

5- David Perkins (1985) is another researcher who emphasizes creative thinking. "He concludes from empirical research, that thinkers can learn to be better reasoners - better 'situation modelers' - in real life activities." (Presseisen, 1986:p.8)

6- Robert Sterling (1984) who emphasizes thinking and learning skills which he presents in a triarchic theory of intelligence. These he posulates as being drawn from an information-processing vector:

> "He specifies particular mental mechanisms that lead to more or less intelligent behavior and that include learning how to do things , (the so-called performance component), planning what to do and how to do them (metacomponents), and performing the task (knowledge-acquisition component)." (Presseisen, 1986:p.7)

7- Arthur Wimberg (1984) who "emphasizes a holistic orientation to learning to improve one's thinking. He emphasizes complete and precise processing, and the combination of various reasoning skills into extended, segmental, and multiple-step applications of thinking focused on a particular problem." (Presseisen, 1986:p.8)

Even a cursory examination of research literature relating to the teaching of thinking reveals it to be vast. It is therefore a challenging task to cull and synthesize essential, significant facts relating to this dimension of thinking/learning. Presseisen (1986) has suggested that the available information may be categorized "as four types of cognitive processes:

A- "Essential cognitive processes - the basic thinking skills that are the building blocks of thought development.

B- "Higher-order cognitive processes - the more complex thinking skills which may be harder to define but which are based on the essential cognitive processes.

C- "Metacognitive processes - the learning to learn skills aimed at making thinking more conscious and the student more aware of the ways one can go about problem solving or decisions making; and

D- "Epistemic cognitive processes - the kinds of thinking related to particular bodies of knowledge areas as well as the interdisciplinary relationships among content areas." (Presseisen, 1986:p.9)

A highlight review of research relating to these categories of cognitive processes can provide keystone data for the planning and conduct of teaching-to-think instruction. Such a "review" follows:

A - The "Essential Cognitive Processes:

Quellmalz (1985) has suggested that there is substantial agreement in academia of the importance, as well as definition of the essential (i.e., basic) cognitive processes. These include recall, recognition, comparison, classification, inference, analgy, inductive and deductive reasoning, interpretation, and evaluation. She also indicates that the need now exists for the development of better tests to measure thinking performance, when it is measured through the abive-noted essential cognitive processes. The meanings of these essential skills are delineated in the glossary to be found in Costa (1985)

B - The "Higher-Order Cognitive Processes:

A review of the literature reveals that in the cognition area much of it:

> "is concerned with how more complex thinking - critical and creative, decision making and problem solving - develops through the student's learning experience. At the heart of this concern is deciding what these forms of complex thinking are." (Presseisen, 1986:p.10)

Currently, there is far less agreement regarding higher-order thinking processes than there is regarding the essential (i.e. basic) cognitive skills. However, as Resnick (1985) suggests, there are some key features of higher-order thinking. These include:

1- It is non-algorithmic; i.e., the path of action is not fully indicated in advance.

2- It tends to be complex; i.e., the total path is not apparent (mentally speaking) from any single vantage point.

3- It "often yields multiple solutions, each with costs and benefits rather than unique solutions. ....

4- "Involves nuanced judgement and interpretation.

5- "Involves the application of multiple criteria, which sometime conflict with one another. ....

6- "Often involves uncertainty. Not everything is known that bears on the task at hand." (Presseisen, 1986:p.10)

7- It also entails self-regulation of the thinking process, and

8- It involves 'making sense' out of apparent disorder; i.e., finding structure and imposing meaning upon the constant stream of perceptual data to which the higher-order thinking individual responds.

It would therefore appear patently clear, as Presseisen (1986) points out, that "simplistic rote information that fits limited instructional sequences is not sufficient as the material upon which to develop students' higher-order thinking." (p.11) In this connection, Presseisen (1986) suggests four types of higher-order thinking processes. She categorizes them by the outcomes sought through each of these complex cognitive processes: i.e., Problem-solving; Decision-making; Critical Thinking; Creative Thinking.

Other researchers suggest supplementing these four; e.g., composing; argumentation; disciplined inquiry; concept formation; comprehending. Sig-

nificantly, however:

> "all such complex processes draw on and are rooted in the student's initial ability to perform the essential (i.e., basic) skills and to apply them in various content areas. ....(and) a solid foundation of all the microskills appears to be a prerequisite of higher-order pe5formance." (Presseisen, 1986: p.1)

In a few words then, this is once again a reminder that before one can learn to walk, one must learn to crawl, effectively ! Therefore - turning to the pertinent question - when should higher-order thinking instruction be introduced into the curriculum? - a generally-accepted answer does not appear evident in the research literature. However - as Presseisen (1986) concludes:

> "Most researchers and educators feel that late middle school or early junior high school is an appropriate time to introduce most students to higher-order processes and to begin to develop the use of these skills in general course work. The inquiring mind of the adolescent needs the stimulation and challenge of complex thinking to motivate academic success." (p.12)

C- The "Metacognitive Processes:

These are the processes that involve the student in:

1- "becoming conscious of their own ways of thinking.

2- of exploring various possible routes to resolving a particular problem.

3- of intellectually becoming engaged with the learning experience." (Presseisen, 1986:p.12)

Sternberg (1983) relates these metacognitive processes to the problem-resolution skills utilized by decision makers at the executive-managerial levels within organizations. He suggests a sequential patte rn of skills consisting of nine steps:

1- "Problem identification
2- Process selection
3- Strategy selection
4- Representation selection
5- Allocation of resources
6-Solution monitoring
7- Sensitivity of feedback
8-Translation of feedback into an action plan
9- Implementation of an action plan." (pp: 9,10)

In addition - Armbruster and Anderson (1981) stress four instructional learning areas to help improve student metacognitive studying practices:

1- "Students should be instructed in the importance of knowing about the criterion task.

2- "Students should be taught about the properties of texts that affect learning.

3- "Students should be taught about the role of motivation, ability and background knowledge in studying.

4- "Students should know why, when, and how to use particular study strategies." (P.155)

These researchers, and others, suggest quite clearly that for metacognitive ways of thinking (i.e., learning-to-learn strategies) to occur, such skills should be taught quite deliberately; quite specifically; quite intentionally. These should not be incidental; i.e., merely a casual by-product of subject-matter instruction/learning. As Presseisen (1986) points out:

"for students to be motivated and involved in higher-order skill development and to give them long-lasting awarenesses that influence overall academic achievement, the development of metacognitive learning skills seems critical to their success. These skills need to be directly taught, according to most researchers, and seem most effective when they are gradually related to specificsubject matters." (p.14)

D- The Epistemic Cognitive Processes:

Internalization of learning and the transfer of training which appear frequently in research relating to the thinking processes involved in epistemologies; i.e. specific bodies of knowledge, are probably the least understood thinking processes. Presseisen (1986) clearly poses the question: Just "how does a student become a good historical thinker or a gifted scientist? How does the more expert learner know how to approach a problem in a given subject area in order to best resolve it? " (p.14)

Current research would suggest that thinking performance is best measured by answering the question - what specific knowledge-content is important to the student's learning? Presseisen's (1986) conclusion:

> "As a base for general curriculum planning, ... content - blended with cognitive and metacognitive skills - seems to be the most practical starting points for much-needed curriculum revision." (p.15)

Further - Beyer (1984) suggests the expectation that improved thinking performance will help students become better processors of information in most epistomologies; i.e., specific knowledge domains.

Thinking & Intelligence

Presseisen (1986) has noted that "thinking is generally assumed to be a cognitive process, a mental act by which knowledge is acquired." (p.2) Beyer (Feb. 1984) defines thinking as the mental manipulation of sensory input to formulate thoughts, reason about thoughts, or judge thoughts.

Among current views regarding intellectual functioning; i.e., thinking - some suggest that intelligence may consist of multi-dimensional abilities. For example, Gardner (1983) has proposed seven different types of intelligence which he views as being relatively independent of each othere: linguistic; musical; logical-mathematic; spatial; bodily-kinesthetic; interpersonal; intrapersonal.

Additionally, as expressed by Sternberg (1983); "It will probably come as no surprise to you that there is no unanimous agreement among psychologists as to the exact nature of intelligence." (p.2) In Sternberg's (1983) view, the principal abilities underlying intelligent behavior include the following:

"1. Recognizing and defining the nature of a problem
2. Deciding upon the processes needed to solve the problem
3. Separating the processes into an optimal strategy
4. Deciding upon how to represent problem information
5. Allocating mental and physical resources to the problem
6. Monitoring and evaluating one's solution processing
7. Responding adequately to external feedback
8. Encoding stimulus elements effectively
9. Inferring relations between stimulus elements
10. Mapping relations between relations
11. Applying old relations to new situations
12. Comparing stimulus elements
13. Responding effectively to novel kinds of tasks and situations
14. Effectively automating information processing

15. Adapting effectively to the environment in which one resides
16. Selecting environments as needed to achieve a better fit of one's abilities and interests to the environment
17. Shaping environments so as to increase one's effective utilization of one's abilities and interests."(p. 24)

Gardner's scheme of intelligence being multi-dimensional and the 'componential' theory of intelligence as proposed by Sternberg - the latter seeking "to understand intelligence in terms of the component processes that make up intelligent performance" (Sternberg, 1983: p.2), clearly suggest, in Sternberg's (1983) words: "We can intervene atthe level of the mental process, teach individuals what processes to use when, how to use them, and how to combine them into workable strategies for task solution." (p.3)

From the viewpoint of everyday work situations, Presseisen(1986) suggests that:

"Classroom teachers need not have a hard and fast theory of intelligence" (p.17)

However, as Presseisen goes on to stress - what is important to emphasize is that :

"developing good thinking (practices) is for all students, not just for the gifted or high-achieving learners in special programs." (underlining added) (p.17)

Conclusions

As Sternberg queries:

"Do we really need interaction programs for training students in intellectual skills ? The answer is 'yes'. During the last decade or so we have witnessed an unprecedented decline in the intellectual skills of our school children. ...One can see this, of course, from the decline in scores on tests such as the Scholastic Aptitude Test (SAT), but college professors don't need SAT scores to be apprised of the decline: They can see it in the poorer class performance, and particularly in the poorer reading and writing of their students. Moreover, thinking skills are needed by more than the college-bound population." (pp. 18,19)

Programs are now available that improve children's intellectual skills by providing them training in thinking processes; i.e., problem identi-

fication; process selection;strategy selection; representation selection; allocation of resources; solution monitoring; sensitivity to feedback. In the selection of such programs careful consideration should be given to such factors as school grade level of learners; their socio-economic level; their intellectual level; particular kinds of skills to be taught; teaching/training time available. Sternberg (1983) recommends the following specific guidelines be utilized in the selection of an appropriate intellectual skills training program:

1. "be based upon a psychological theory of intellectual processes it seeks to train, and upon an educational theory of the way in which the processes will be trained. ....

2. "be socio-culturally appropriate for the students to whom it is being administered. ....

3. "provide explicit training both in the mental processes used in task performance (performance components and knowledge-acquisition components) and in self-management strategies for using these components (metacomponents). ....

4. "be responsive to the motivational as well as the intellectual needs of students. ....

5. "be sensitive to individual differences. ....

6. "provide explicit links between the training it provides and functioning in the real world. ....

7. "take into account demonstrated empirical success in implementations similar to one's own planned implementation. ....A key to success is choosing a program with a demonstrated track record in situations similar to one's own. ....

8. (have) "expectations ....appropriate for what the program can accomplish. ....

9. " once completed ....be fully and appropriately evaluated by competent program evaluators. ....(and) a full set of formative and summative evaluations should be conducted." (pp. 20,21,22)

It is currently recognized that curriculum content can effect improvements in student thinking practices. However - in order to maximize such learning, to transfer the classroom into inquisitive environments fostering student

learning - particular attention must be directed to how subject-matter content is taught, as well as why the subject-matter is being taught. As Sternberg (1983) concludes:

> "The vast majority of school children are not now being exposed to process training in school curricula (i.e., intellectual skills training). Indeed, the heavy content-orientation of traditional school curricula would barely allow room for such training. It is for this reason that the time has come for supplementation of standard curricula with training in intellectual skills." (p.23)

And finally - in Presseisen's (1986) words:

> "In sum, there seems to be a strong instructional thrust in the thinking skills movement, an emphasis that furthers a user-friendly classroom environment. Research in both cognitive development and classroom pedagogy suggests strategies for improving student learning in this context. ...
>
> "Questions relative to classroom practice to teach thinking are not easily answered by literature because research is by no means complete at this time. ....Exploring the influence of teaching thinking on the traditional curricular, instructional, and assessment tasks of schooling are, in the end, the most meaningful activities for teachers to become engaged in." (pp. 24,26)

* * * * * * * * * * *

1987

References

Armbruster, Bonnie B. & Anderson, Thomas H. "Research Synthesis on Study Skills" Educational Leadership. 39. no.2 (Nov.1981) 154-56.

Beyer, Barry K. ASCD Curriculum Study Institute. "Practical Approaches to teaching thinking skills in every classroom." Feb. 1984.

---- "Improving Thinking Skills - Defining the Problem." Phi Delta Kappan 65. no.7. (March 1984) 486-90.

Carnegie Task Force on Teaching as a Profession. "A Nation Prepared: Teachers for the 21st Century". Reprinted in Education Week 5. no.35 (May 21,1986) 11-18

Costa, Arthur L. (Ed.) Developing Minds: A Resource Book for Teaching Thinking. Alexandria, VA. Assoc. for Supervision & Curriculum Development. 1985.

deBono, Edward "The Direct Teaching of Thinking as a Skill" Phi DeltaKappan 64. no.10. (June 1983) 703-8.

Ennis, Robert H. "A Logical Basis for Measuring Critical Thinking Skills." Educational Leadership 43. no.2. (Oct. 1985) 44-48.

Feuerstein, Reuven. Instrumental Enrichment: An Intervention Program for Cognitive Modifiability. Baltimore. University Park Press. 1980.

Gardner, Howard. Frames of Mind: The Theory of Multiple Intelligence. New York, Basic Books, 1983.

Lipman, Matthew "Philosophy for Children and Critical Thinking" National Forum 65. no.1. (Winter 1985): 118-123.

Lochhead, Jack "New Horizons in Educational Development", in Review of Research in Education, edited by Edward W. Gordon, Vol.12, Washington, D.C. 1985.

Perkins, David M. "Creativity by Design" Educational Leadership. 42. no.1. (Sept. 1, 1984) 18-25.

Preisseisen, Barbara Z. "Thinking Skills: Meanings, Models, and Materials". Philadelphia, Research for Better Schools. 1984

----- "Thinking Skills: Meaning & Models" in Developing Minds: A Resource Book for Teaching Thinking" Arthur L. Costa (ed.) Alexandria, Va. Assoc. for Supervision & Curriculum Development. 1985.

----- Thinking Skills: Research and Practice, Washington, D.C. National Education Association. 1986.

Quellmalz, Edys S. "Needed: Better Methods for Testing Higher Order Thinking Skills" Educational Leadership 43. no.2. (Oct. 1985); 29-35.

Resnick, Lauren B. Education and Learning to Think. Pittsburgh: Learning Research & Development Center. Univ. of Pittsburgh. 1985.

Sternberg, Robert J. "The nature of Mental Abilities. American Psychologist 1979; 34, 214-230

----- How Can We Teach Intelligence? Philadelphia, Research for Better Schools. 1983

-----"What Should Intelligence Tests Test? Implications of a Triarchic Theory of Intelligence for Intelligence Testing". Educational Leadership. 42. no.1. (Sept. 1984): 38-48.

Whimby, Arthur. "The Key to Higher Order Thinking Is Precise Processing" Educational Leadership . 42. no.1. (Sept. 1984): 60-70.

+ + + + + + + + +